

CLAIMS

- 1 1. In a system for processing a signal containing video data comprising  
2 groups of interleaved trellis encoded data packets, an apparatus for providing  
3 trellis decoded data, comprising:  
4 first means (2) for adaptively filtering signal distortions;  
5 first means (5) for identifying and re-encoding trellis decoded data as  
6 received from the first means (2) for adaptively filtering signal distortions;  
7 a feedback filter (8) responsive to the re-encoded trellis decoded data (6);  
8 and  
9 a trellis decoder (3) responsive to an output signal generated by the  
10 feedback filter, the trellis decoder providing trellis decoded data.
- 1 2. A system according to claim 1, wherein the first means (2) for adaptively  
2 filtering signal distortions is a first decision feedback equalizer.
- 1 3. A system according to claim 2, further including a second decision  
2 feedback equalizer (4) comprising the feedback filter (8) responsive to the re-  
3 encoded trellis decoded data (6).
- 1 4. A system according to claim 3, further comprising a module (1), the  
2 module (1) comprising the second decision feedback equalizer (4) and the first  
3 means (5) for identifying and re-encoding trellis decoded data as received from  
4 the first means (2) for adaptively filtering signal distortions.
- 1 5. A system according to claim 4, further comprising a plurality of modules,  
2 wherein a first module (1) is responsive to data from the first means (2) for  
3 adaptively filtering signal distortions, each succeeding module is responsive to

4 data received from a preceding module and the last trellis decoder (3) is  
5 responsive to data received from the last module.

1 6. A system according to claim 5, wherein each module further comprises:  
2 a delay unit (7) for synchronizing data received from a previous  
3 stage; and  
4 a feed forward filter responsive to data received from the delay unit  
5 (7).

1 7. A system according to claim 6, wherein the first means (5) for identifying  
2 and re-encoding trellis decoded data residing within the module (1) is adapted to  
3 generate a hard decision data output.

1 8. A system according to claim 6, wherein the first means (5) for identifying  
2 and re-encoding trellis decoded data residing within the module (1) is adapted to  
3 generate a soft decision data output.

5 9. A system according to claim 8, wherein the first means (5) for identifying  
6 and re-encoding trellis decoded data residing within the module (1) is adapted to  
7 generate a soft decision data output satisfying an equation

$$\tilde{I}_j = \sum_{m=1}^M P_{jm}^{(sp)} \cdot I(m)$$

8  
9 where  $I(m)$  is a channel symbol corresponding to a label  $m = 1, 2, \dots, M$ .

1 10. In a system for processing video data comprising groups of interleaved trellis  
2 encoded data packets, a method of providing trellis decoded data comprising the

3 steps of:  
4       applying adaptive filtering to the video data and thereby generating a first  
5 output signal responsive to the adaptive filtering;  
6       decoding and re-encoding the first output signal and thereby generating a  
7 re-encoded output signal;  
8       applying the re-encoded output signal to a second adaptive filter and  
9 thereby generating a second output signal; and  
10       applying the second output signal to a trellis decoder and thereby  
11 generating a decoded output signal.

1 11. A system according to claim 10, further comprising the step of forming a  
2 module that performs the steps of:  
3       decoding and re-encoding the first output signal; and  
4       applying the re-encoded output signal to a second adaptive filter.

5 12. A system according to claim 11, wherein each module further comprises a  
6 delay unit for synchronizing data received from a previous stage.

7 13. A system according to claim 12, further comprising the step of cascading a  
8 plurality of modules so as to receive the first output signal and subsequently  
9 apply a final output signal to the trellis decoder and thereby generate the  
10 decoded output signal.

1 14. A system according to claim 13, further comprising the step of applying the  
2 re-encoded output signal within each module to the feedback filter in the same  
3 module.

1 15. A system according to claim 14, further comprising the step of decoding and  
 2 re-encoding within each module so as to generate a re-encoded output signal  
 3 that is a hard decision version of the interleaved trellis encoded data packets.

1 16. A system according to claim 14, further comprising the step of decoding and  
 2 re-encoding within each module so as to generate a re-encoded output signal  
 3 that is a soft decision version of the interleaved trellis encoded data packets.

4  
 5 17. A system according to claim 16, wherein the step of decoding and re-  
 6 encoding trellis decoded data residing within each module generates a soft  
 7 decision data output satisfying an equation

$$\tilde{I}_j = \sum_{m=1}^M P_{jm}^{(sp)} \cdot I(m)$$

8  
 9 where  $I(m)$  is a channel symbol corresponding to a label  $m = 1, 2, \dots, M$  and  $P_{jm}^{(sp)}$   
 10 is the *a posteriori* probability of the  $m^{(th)}$  channel symbol at time  $j$  for the  
 11 survival path  $(sp)$ .

1 18. An equalizer/trellis decoder system for processing high definition television  
 2 signals, comprising:  
 3 a first adaptive filter (2);  
 4 a trellis decoder and re-encoder (5) adapted to receive trellis encoded  
 5 data packets from the first adaptive filter (2);  
 6 a second adaptive filter (4) adapted to receive an input signal (6)  
 7 generated by the trellis decoder and re-encoder (5); and

8 a final trellis decoder (3) adapted to receive an input signal from the  
9 second adaptive filter (4).

1 19. The equalizer/trellis decoder system of claim 18 wherein the second  
2 adaptive filter (4) is a decision feedback equalizer further comprising:  
3 a feedback filter (8); and  
4 a feed forward filter.

1 20. The equalizer/trellis decoder system of claim 19 further comprising a delay  
2 unit (7) adapted to receive as an input a signal (21) that is an input to the first  
3 adaptive filter (2), the delay unit (7) being interconnected to and synchronizing  
4 data received by the feed forward filter.

1 21. The equalizer/trellis decoder of claim 20 wherein an output signal (6)  
2 generated by the trellis decoder and re-encoder (5) produces soft decision data.

1 22. A system according to claim 21, wherein the output signal (6) generated by  
2 the trellis decoder and re-encoder (5) satisfies an equation

$$\tilde{I}_j = \sum_{m=1}^M P_{jm}^{(sp)} \cdot I(m)$$

3 where  $I(m)$  is the channel symbol corresponding to the label  
4  $m = 1, 2, \dots, M$  and  $P_{jm}^{(sp)}$  is the *a posteriori* probability of the  $m^{(th)}$  channel symbol at  
5 time  $j$  for the survival path  $(sp)$ .  
6

1 23. The equalizer/trellis decoder of claim 19 wherein an output signal generated  
2 by the trellis decoder and re-encoder (5) produces hard decision data.

- 1 24. A system according to claim 18 wherein the first adaptive filter (2) is a
- 2 Decision Feedback Equalizer operating in either (hard) automatic switching mode
- 3 or soft automatic switching mode.